

Daily Report

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Visual SVM

Today I read [1, 2] and did the first pass of [3] to perform a further survey on tour methods.

[1] is just an extended version of [4] (which I mentioned before) that includes some results on non-linear kernels. Figure 1 from [1] shows some projection results. However in a real dataset, I think that the decision boundary will not be as smooth as those in the figures for the curved boundaries might be twisted heavily in the high-dimensional space. Another issue is that an interaction like “slightly rotate” may be useful to view the decision boundaries from directions slightly different from the current projection setting.

[2] is a survey that introduced the basic tour method and some other variations including *grand tour*, *projection pursuit guided tour* and *tour with manual controls*. In traditional tour method, one of the problems is that it is difficult to locate the “right” or even the “best” target projection plane that enables users to find interesting patterns they want. *Grand tour* uses random projection sequences to generate a series of continuous target projection planes that almost fill all directions in the space. Furthermore, *projection pursuit guided tour* generates a series of planes by optimizing a target function. The target function usually represents a specific pattern of the projection like a hole or a cluster. Along the series of planes, the target function is gradually optimized, which indicates that the pattern is gradually extracted on the projection result. Interestingly, in this paper it emphasized the effectiveness of applying tour method on classification by an example of extracting decision rules.

In our Visual SVM, the decision boundary should be an natural and appropriate path for tours. In the next step I will consider how to represent the core structure of SVM on the projection plane, like support vectors, distances from data instances to the separating plane, as well as the effect on the projection result from tuning parameters.

References

- [1] D. Caragea, D. Cook, and V. Honavar, “Visual methods for examining support vector machines results, with applications to gene expression data analysis,” tech. rep., 2005.
- [2] D. Cook, A. Buja, E.-K. Lee, and H. Wickham, “Grand tours, projection pursuit guided tours, and manual controls,” pp. 295–314, 2008.
- [3] N. Elmqvist, P. Dragicevic, and J. D. Fekete, “Rolling the Dice: Multidimensional Visual Exploration using Scatterplot Matrix Navigation,” *IEEE Transactions on Visualization and Computer Graphics*, vol. 14, no. 6, pp. 1531–1538, 2009.

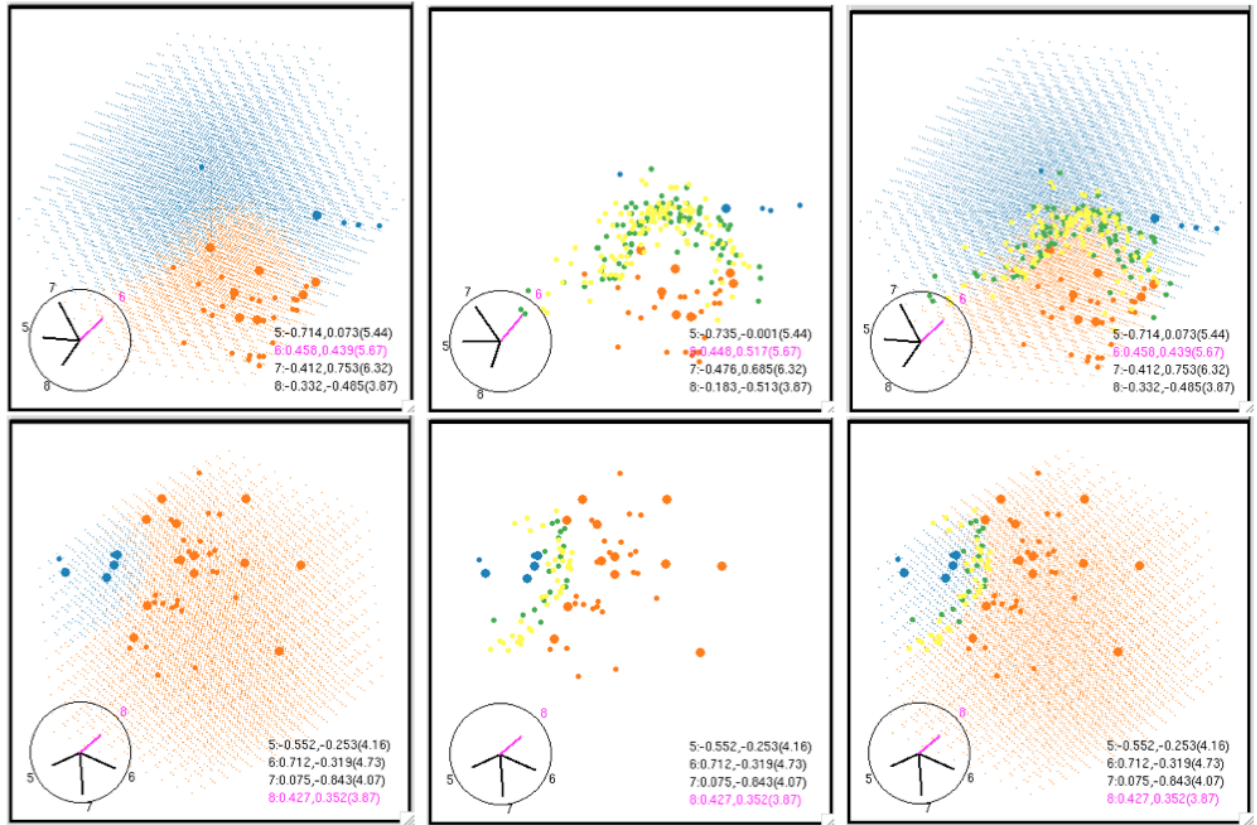


Figure 1: Some results on non-linear separation.

- [4] D. Caragea, D. Cook, H. Wickham, and V. Honavar, "Visual Methods for Examining SVM Classifiers," *Visual Data Mining*, Apr. 2008.